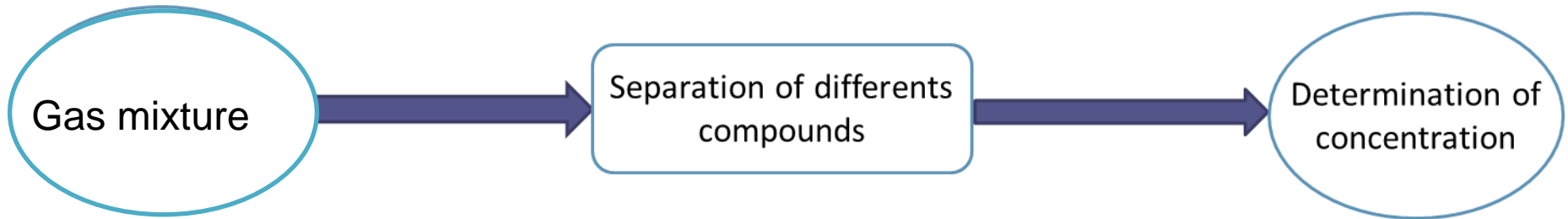


Gas Chromatography Introduction

Chromatotec®

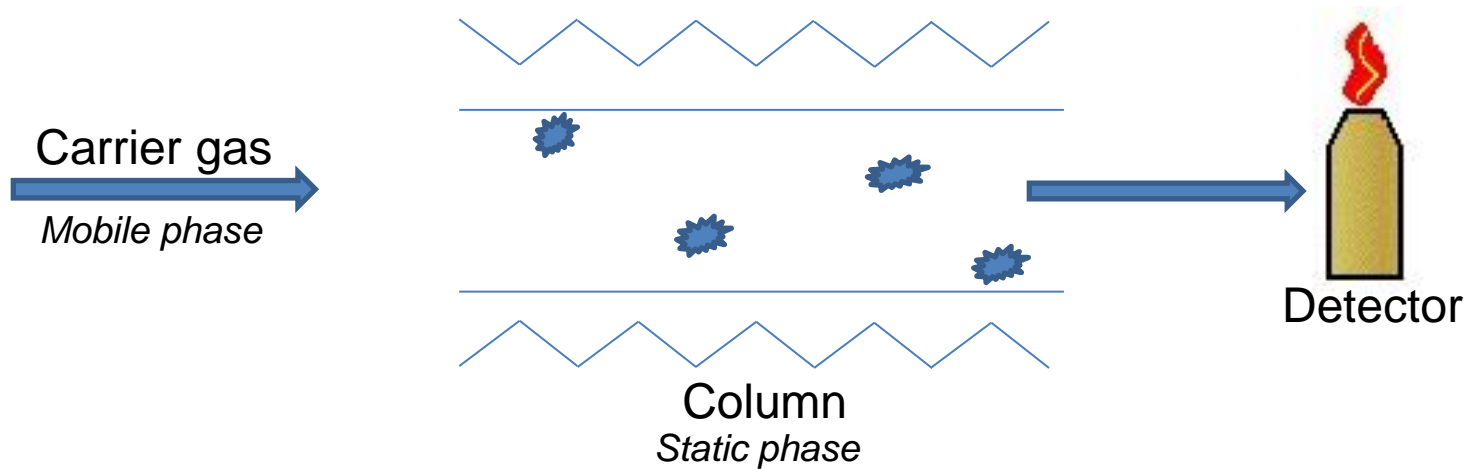
Principle



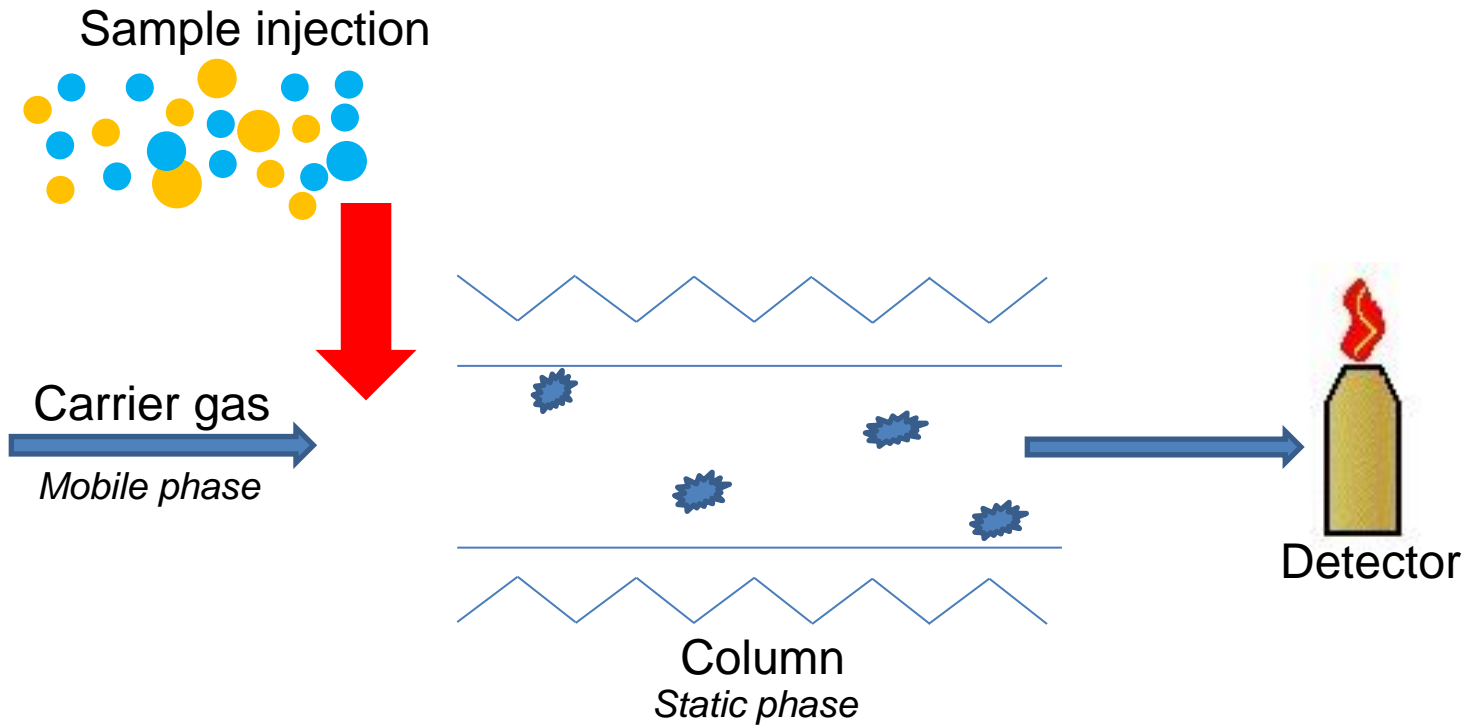
A technique in which separation is accomplished by partitioning volatilized substances between a mobile carrier gas and a stationary phase. The technique is often termed “GC.”

- GC is done using an instrument called a gas chromatograph
- The separation is done in a column, which is contained in the oven of the gas chromatograph.

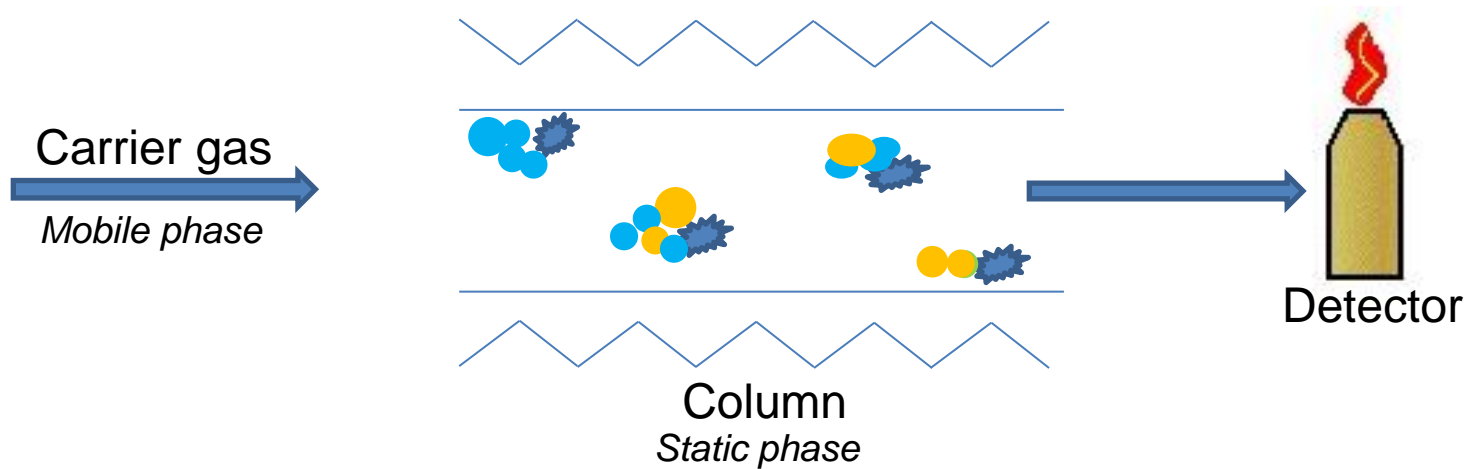
Chromatography principle



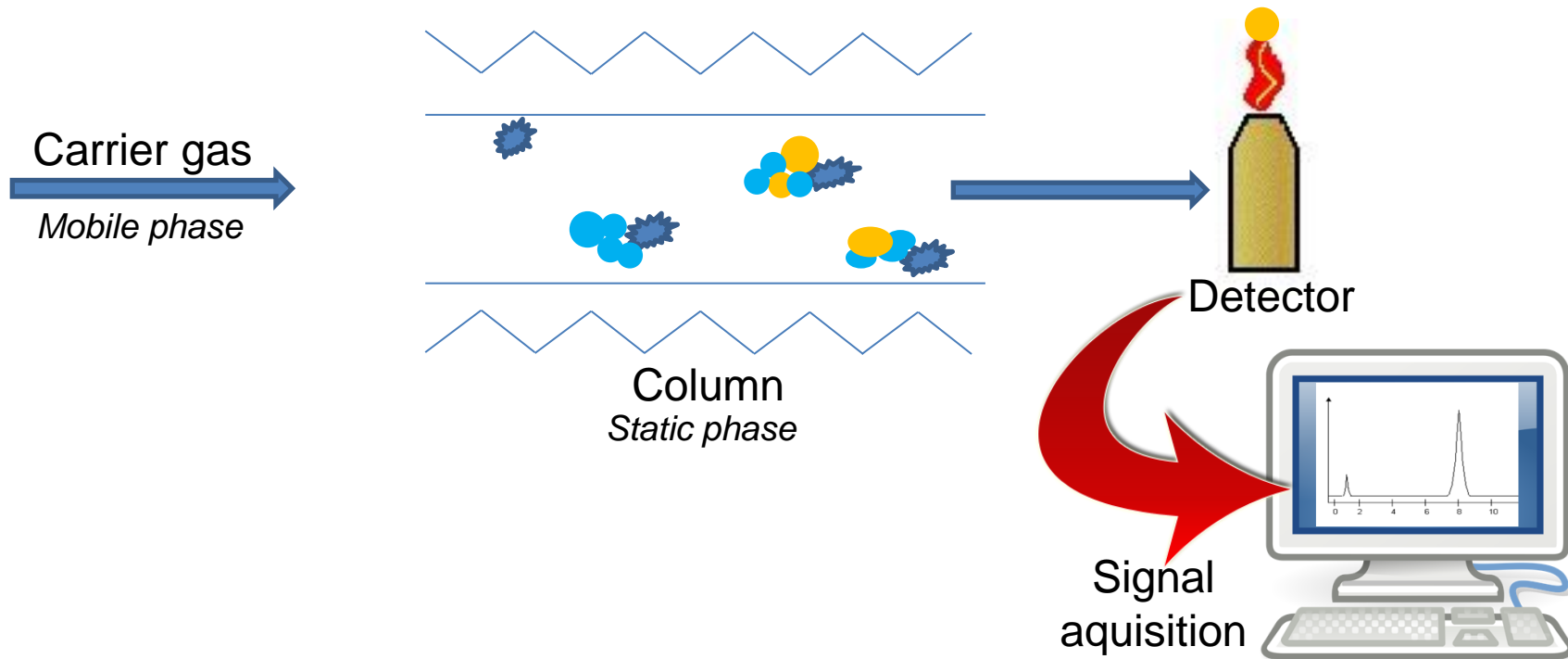
Chromatography principle



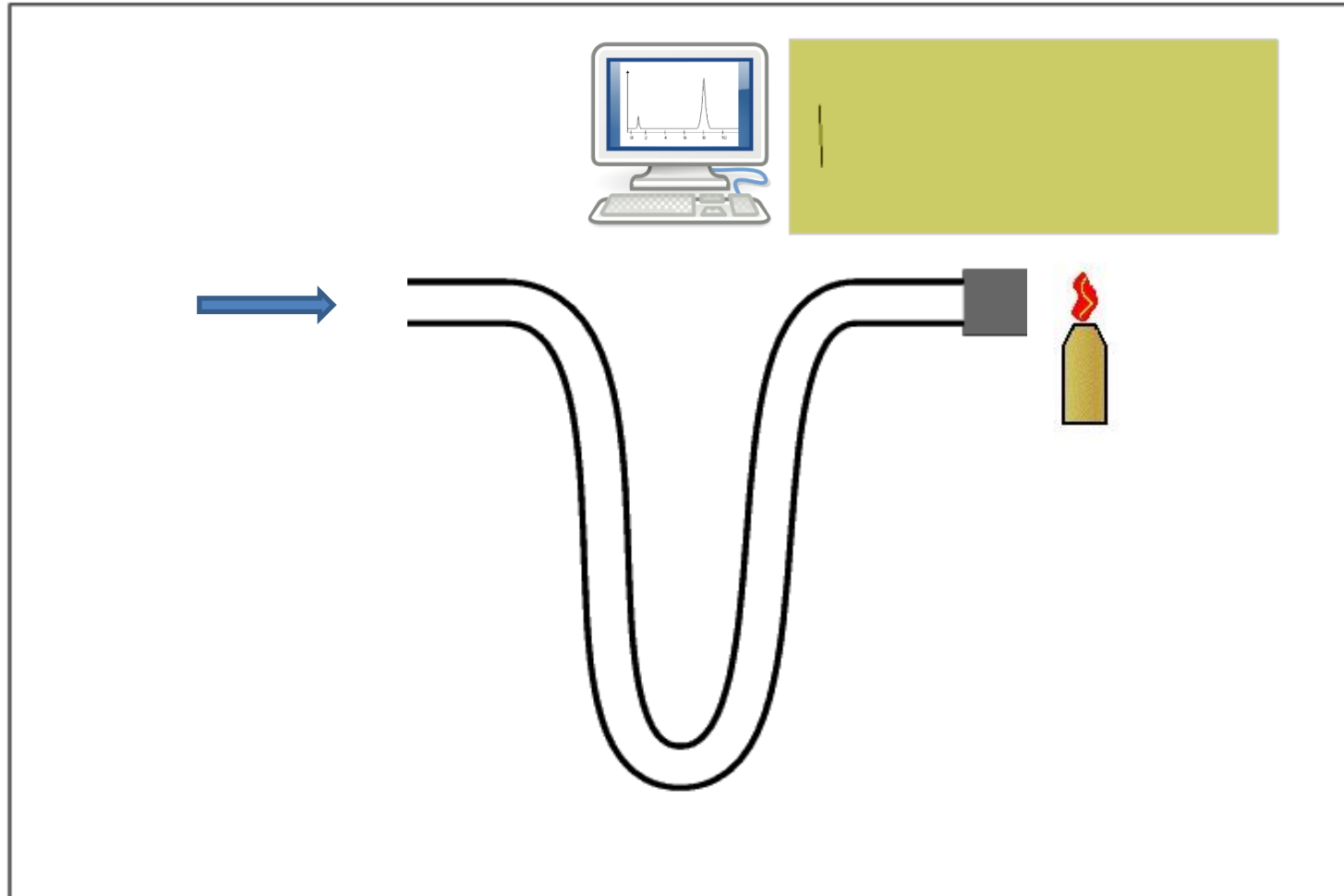
Chromatography principle



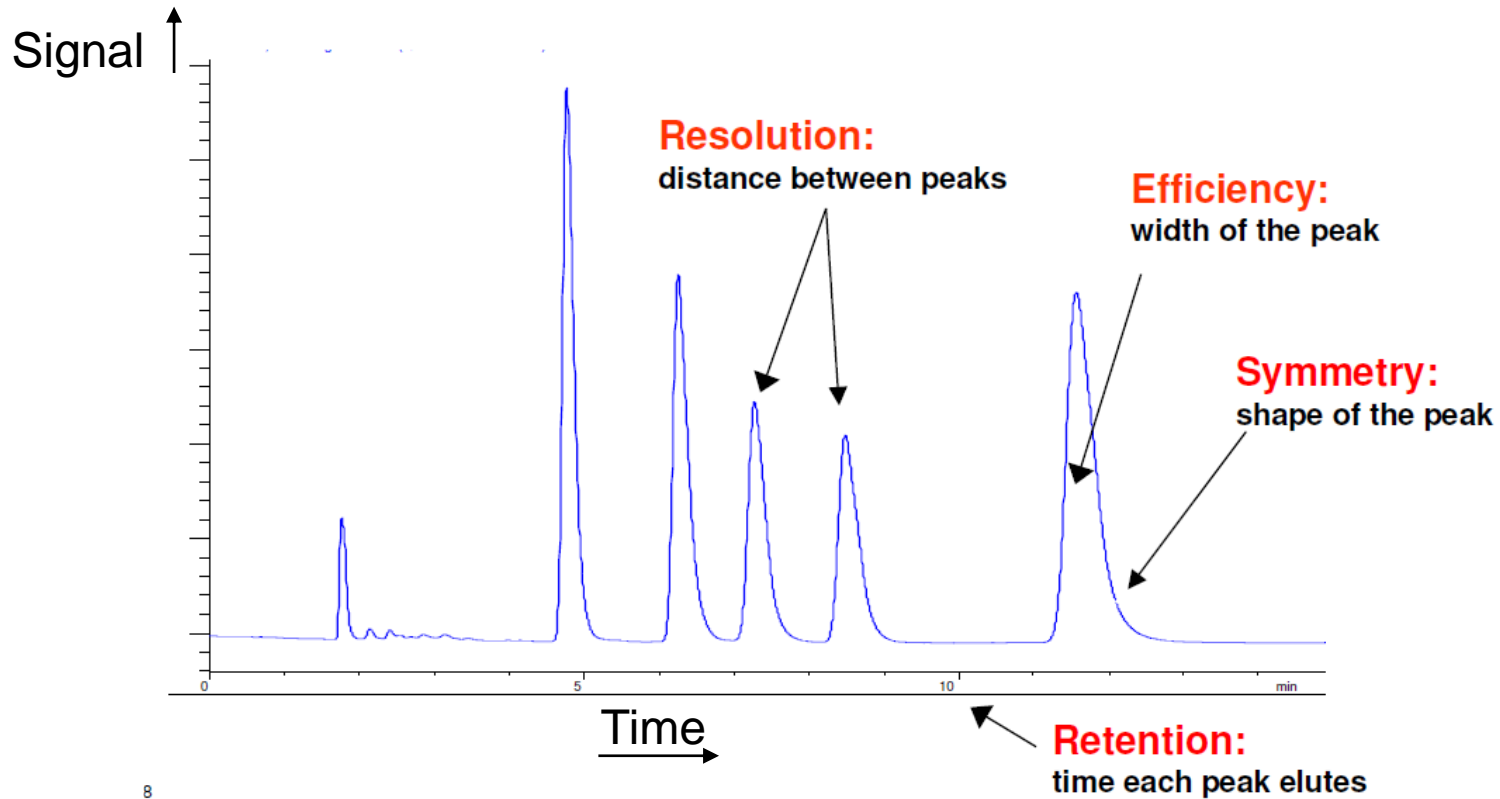
Chromatography principle



Chromatography principle



Acquisition



8

- The retention time is used to identify compounds
- Area of the peak is used for compound quantifications

Gas chromatography

- Advantages of Gas chromatography
 - Efficient, providing high resolution
 - Highly accurate quantitative analysis, typically RSDs of 1-5 %
 - Requires small volumes
 - Reliable and simple
 - Inexpensive
- Gas chromatograph designed by Chromatotec:
 - Online instruments
 - Designed for industrial applications
 - Continuous monitoring
 - Communication devices optimized for industrial applications
 - Optimized instruments depending on the applications
 - ...

3 different steps :



Sampling

Separation

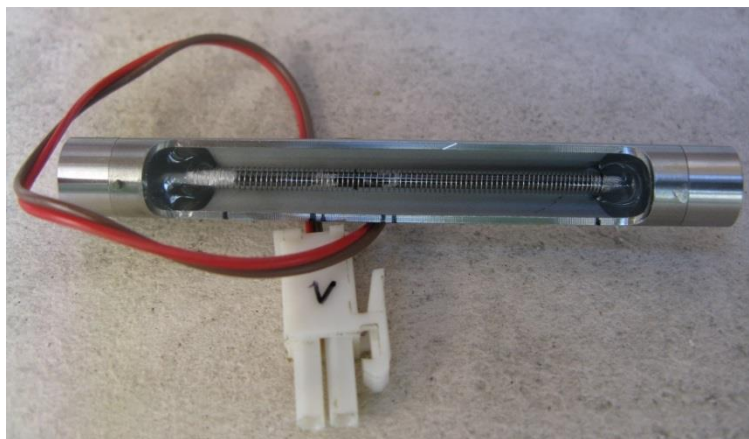
Detection

Sampling



Loops of different volumes:

- Concentrated samples
- Molecules which cannot be pre-concentrated

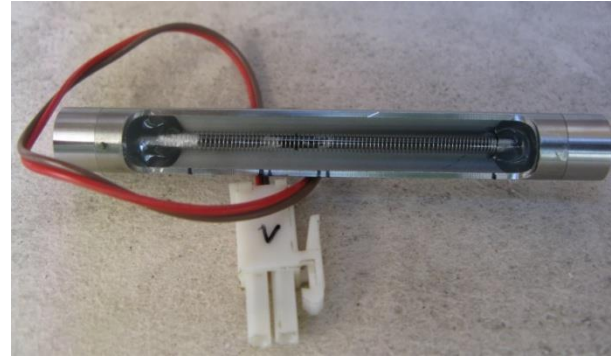


Different adsorbents can be used in the field of thermal adsorption/desorption.

Choosing the right adsorbent can be difficult. The goal in selecting the proper adsorbent is to choose one that can:

- Retain a specific or group of analytes for a specified sample volume.
- However, just as important the adsorbent must also be able to release the analyte(s) during the desorption process.

Molecules are adsorbed on adsorbant in the trap



ABsorption



ADsorption

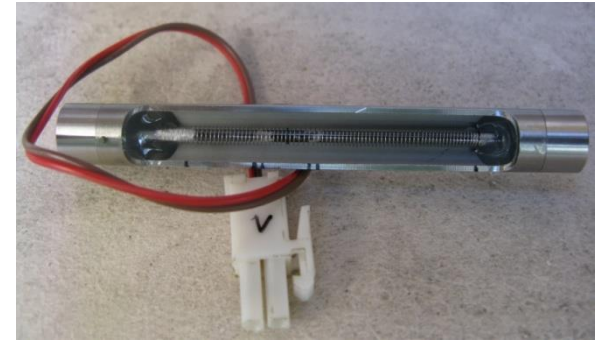
Sampling

Chromatotec® develops specific traps to meet requirements of different applications:

- Trap for C2-C6
- Trap for C6-C12
- Trap for Sulfur compounds
- ...

Depending on the application, the trap can be cooled down to increase the trapping efficiency.

To increase the desorption efficiency, the thermal desorption temperature will be optimized depending on the application.



3 different steps :

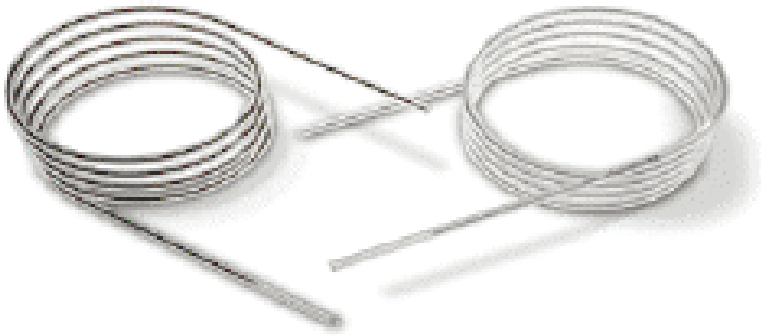


Sampling

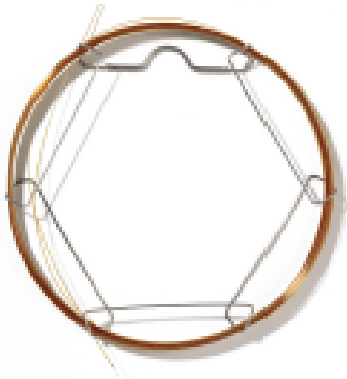
Separation

Detection

Separation



Packed Columns



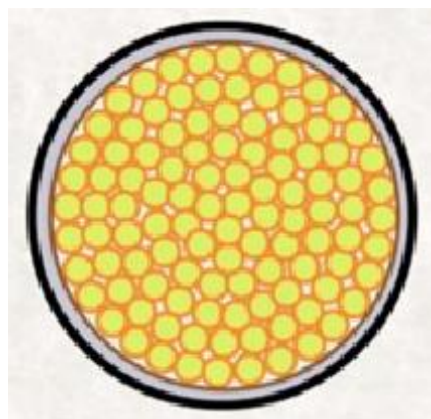
Capillary columns

Separation

Separation is the heart of gas chromatography. The first columns were metal tubes packed with inert supports on which stationary liquids were coated.

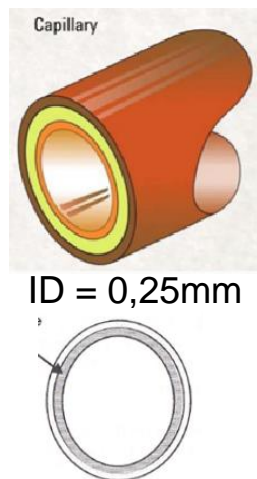
Today, the most popular columns are made of fused silica and are open tubes with capillary dimensions. The stationary phase is coated on the surface of the wall.

Packed Columns



1/8" OD (3,17mm)

Capillary columns



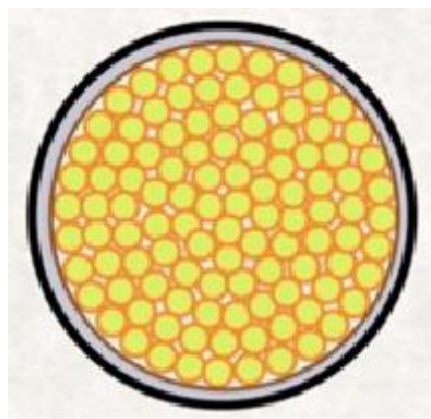
	Capillary	Packed
Length	60 m	2 m
Theoretical plates	3000 – 5000	2000
Total plates	180K – 300K	4000

Separation

Separation is the heart of gas chromatography. The first columns were metal tubes packed with inert supports on which stationary liquids were coated.

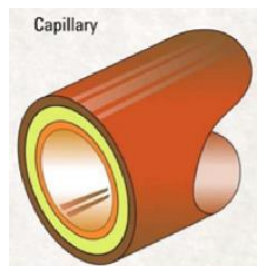
Today, the most popular columns are made of fused silica and are open tubes with capillary dimensions. The stationary phase is coated on the surface of the wall.

Packed Columns

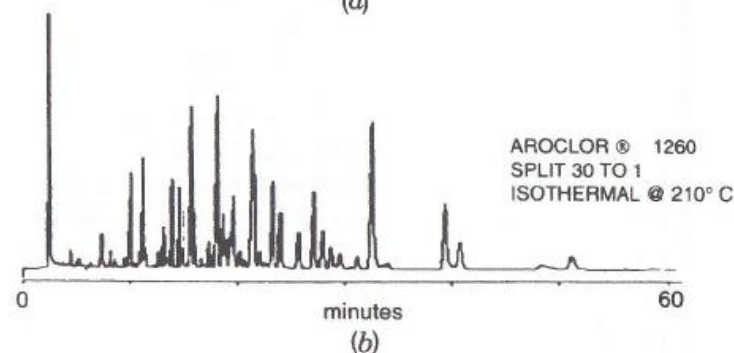
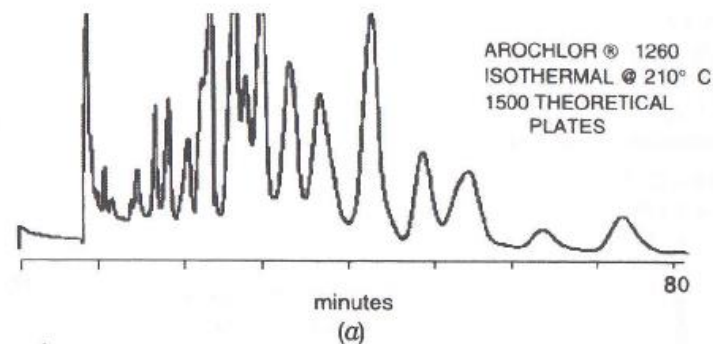
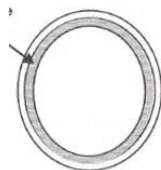


1/8" OD (3,17mm)

Capillary columns

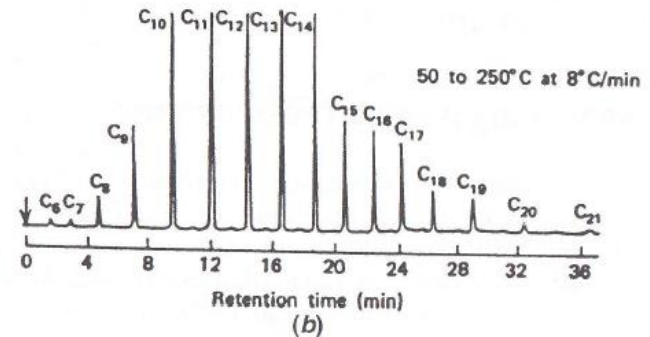
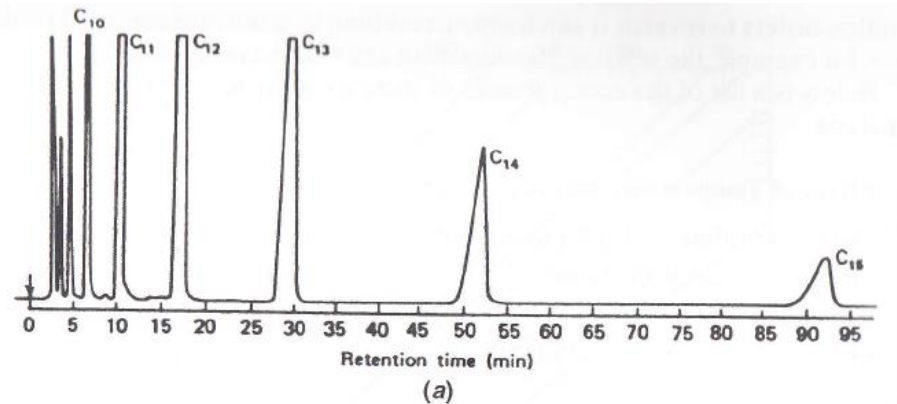


ID = 0,25mm



Separation

- For each application, GCs designed by Chromatotec® have specific:
 - Column types
 - Pressure program
 - Temperature program
- All capillary columns are metallic columns:
 - Unbreakable
 - Can be heat up above 200 °C



3 different steps :



Sampling

Separation

Detection

Kinds of detectors

Many different GC detectors are available.

- Universal → nearly all compounds will give some signal.
- Selective or specific to a class of compound → only several compounds give a signal

Universal :

MSD (*Mass Spectrometry*): ID based on weight of fragments and fragmentation pattern.

TCD (*Thermal Conductivity Detector*): ID based on differences in their conductance of heat

Selective :

Electrochemical detector : sulfur compounds

FID (*Flame Ionization Detector*) : organic compounds with C-H bounds

FPD (*Flame photometric Detector*): Sulfur, phosphorous compounds

PID (*Photolonization Detector*) : detection of compounds with a specific ionisation energy

MS (Mass spectrometer) using “Multiple Ion Detection” mode

Model	Compounds	Application	Concentration	Loop / Trap	Detector	Carrier Gas
airmoVOC C2-C6	Light hydrocarbons from C2 to C6	Ambient / General	ppt / ppb / ppm	Trap with Peltier cooler	FID	H2
airmoVOC C6-C12	Heavy hydrocarbons from C6 to C12	Ambient / General	ppt / ppb / ppm	Trap	FID	H2
airmoVOC BTEX	BTEX	contaminated land	ppt / ppb / ppm	Trap	FID	H2
airTOXIC	BTEX and option: 1,3-butadiene	Ambient / General	ppt / ppb / ppm	Trap	PID	N2
chromaFID	VOCs, BTEX, light compounds	General	ppm	Loop	FID	H2
chromaTHC	VOCs, CH4 and total hydrocarbons	General	ppm	Loop	FID	N2 / H2 / air
chromaTCD	Ne / H2 / O2 / N2 / CO / CO2 / CH4	Pure gas	ppm / %	Loop	TCD	He / Ar / N2
chromaDID	Ne / H2 / O2 / N2 / CO / CO2 / CH4	Pure gas	ppb / ppm	Loop	DID	He
chromaS	Total sulfurs / COS / SO2 / CS2 / H2S	Paper / waste water / Natural gas / CO2	ppb / ppm	Loop	FPD	H2 / air
TRSMEDOR	TRS / H2S / DMS / Mercaptans / SO2	Waste water / Ambient / Odor emissions	ppb / ppm	Loop	Electrochemical	air / N2
energyMEDOR	Sulfurs / H2S / Mercaptans / THT	Monitoring / odorization control	ppb / ppm	Loop	Electrochemical	air / N2
THT MEDOR	THT	Monitoring / odorization control	ppb / ppm	Loop	Electrochemical	air / N2
H2S TOS TS MEDOR	H2S / TOS / TS	Monitoring / process / safety	ppb / ppm	Loop	Electrochemical	air / N2
Trap GC MS	Hydrocarbons / toxic compounds	Ambient / General / Clean room	ppt / ppb / ppm	Trap	Mass / FID	H2



Thank you for your attention !